

Weathering Narrow Gauge Steam Locomotives

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1. Locomotives Characteristics

- a. Study prototype photos past and present. Use these pictures as a guide to determine how and where a locomotive weathers and ages.
- b. Determine what type and degree of weathering you want to achieve on your locomotive.
 - For the most part the D&RGW "C" class engines were dirtier than "K" class locomotives in the 1940's.
 - K-36 class locomotives numbers 486 and 488 for the most part were dirtier than the rest of the "K" class locomotives in the 1940's and early 1950's. Number 483 was the cleanest.
- c. We, as modelers, tend to over-weather our rolling stock as compared to the prototype. Keep this in mind when you are applying your weathering.
- d. A critical aspect will be light in your train room/layout. You will have to find what degree of weathering is best for your lighting. Example: If you have normal room lighting you may find medium weathering too dark whereas if you have specific layout lighting, medium weathering may seem a little on the light side. This is a balancing act that only you can answer.

2. How does a locomotive get weathered?

- a. Soot, water, rust, coal, road (right-of-way) grime, lubricating oils, sun, internal heat of the boiler and tender all work together to different degrees to age a locomotive. Soot and dirt kicked up by the running gear, draft, and wheels are the most apparent.
- b. Soot weathers back and down the locomotive. Pictures will show soot-covered smoke-boxes that appear as black as the boiler, yet the front of the smoke-box/boiler face is still clean/silvery.



D&RGW K-36, #480, Monarch Mine circa 1950

- c. Dirt is kicked up and carried with the draft of the moving locomotive and is most prevalent on the running gear and the tender's lower edge. Dirt kicked up on any moving object forms patterns or waves. The rear axles of a locomotive get dirtier compared the front due to this draft/wave motion. Dirt will form on the front edge of a tender, taper off some over the front truck, thicken up in the center, taper off again over the rear truck and thicken up again on the rear edge of the tender.
- d. Rust is formed in areas where there is standing water or repeated condensation. Rust will form around the tender deck lip and water hatch were it is bolted onto the tender but not necessary on the lid itself. Rust will also form on locomotive boiler washout plugs after a few months of service. Rust can also be found on boiler sheets seams under the steam turret where water collects, on the counter weight under the air pump and on the firebox in and around the cock valves, and on the tender leaf springs. Rust can be found on tender sides depending on the age or if bolts have started to rust. K-37's, #492 and #497 had significant rusting on their tenders in their later years.
- e. Grease can be slung out onto counter-weights from the axle and rods where they are attached to the counter-weights. This is an often overlooked detail.



C&TS RR, K-27, #463, after one and half seasons of operation. Notice the rust by the builder's plate and calcium deposits on the boiler jacket in front of the cab.

3. Getting Started

- a. Tools
 - Good "CLEAN" airbrush. Clean it before your project regardless of how clean it was when you put it away.
 - Compressor with an air tank and regulator for a controlled and constant source of air. You can purchase a quality air compressor from Wal-Mart for under \$125. This is much cheaper then "model" air compressors.
 - Safe, clean spray area and respirator if necessary
 - 'Lazy-susan'. Place your item on the 'lazy-susan' and turn as needed to paint it without having to touch it.
 - Paint with same type of lighting your model will be displayed in.

- Latex type disposable gloves
- Lint free towels for spills.
- Foam cradle to hold your engine upside down while you spray the running gear when it's running
- Small plastic blocks (Lego works great) to support the tender up off the 'lazy-susan' so you spray the underside of the tender edges.
- A practice spray item (I use a piece of white styrene with portions painted gloss black). This ensures the color(s) are what you want, and that the paint is flowing as it should with regards to mixture ratio, volume and force. I practice spray my dirt and rust on the black, and my black on the white. Most of the weathering airbrushing is done between 15 – 20 PSI.
- Some modelers find spraying upwards gives them a straighter line. Another option is to clamp a smooth board or similar object to the edge of the paint table at a right angle and use this as a guide for your hand/wrist while you spray – similar to using a ruler to make a more straight line on paper.

b. You and the paint environment

- Do you have enough time to do this - always add an hour plus to a project. Avoid interruptions.
- Wear a nylon jacket to prevent lint from your clothing from getting on your finish. Or just wear shorts. Lint from your clothing is the biggest contaminant you will have in your paint area.
- Turn off your heat or AC if there is a chance that something (animal hair, carpet lint, dust, etc) will be carried by your system.

c. Paints

Floquil, Model Master, Scale Coat II and Star Brand Paints (PBL Product) paints seem to work the best for me for airbrushing weathering. Paints and thinner mixtures I use - and for what – are as follows:

- Floquil Engine Black, 70 percent Dio-sol. Initial soot, coal dust and final blending color.
- Model Master Jet Engine Exhaust and Burnt Iron for the back head. These come ready to airbrush.
- For rust I use PBL SP Daylight Orange. This is a bright orange color that allows for it to be muted down to whatever hue you desire. Floquil Rust color starts as a medium to dark rust color and you can only go darker from here. Using SP Daylight allows much more flexibility in bringing out the different shades of rust. Using sparing on the tender sides and tender wrapper bottom. Internal water leaks will show up on the tender wrapper bottom. Rust can also be used on the smoke box to show aging and wear caused by internal heat and outside elements affecting this area at the same time. PBL SP Daylight Orange 10 – 15 percent to their Star Brand Paint thinner.
- Floquil Earth 20 percent, Floquil Roof Brown 10 percent, Floquil Crystal Coat or High Gloss 5 percent, 65 percent Dio-sol. Road grime color, dirt kicked up from the roadbed. The Crystal Coat or High Gloss allows this mixture to flow on smoother than a flat pigment.
- Semi-gloss black. Grease (dry brushed).
- Flat sealant used to protect your weathering. I find PBL Flat very easy to use and it dries to the touch within 30 seconds. This is a huge advantage in preventing contaminants getting on your finish.
- Scale Coat II Loco Black for cinder/smoke discoloration on the front of the domes. This is very deep black color. This is the last color airbrushed (over the flat). This is my very last color I use for soot highlights. Sometimes I will mix in Baby Powder to the paint for a dead flat finish.
- Floquil Flat, Crystal Coat/High Gloss. Used to secure coal and cinders
- Testors Leather. Cab arm rests.
- PBL's Flat. Final sealant coat. This paint dries in 20 -30 seconds and does not require any baking.

NOTE:

- a. These colors are for suited for D&RGW NG weathering scheme.
- b. The mixture ratios are not scientific or a steadfast rule. Your ultimate goal is a spray pattern (individual drops of paint) so fine that it cannot be readily detected by sight. Remember to use your practice item first. What I do is conduct a test spray on scrap styrene and look at under my shop lamp magnifier – if I cannot see the individual spray dots then no one will see them with the naked eye. The trick is patience, then slowly build up the colors in repeated airbrush applications.
- c. You'll notice I never mentioned Floquil Grime. This is not a forgiving color. It goes on looking great but it dries to an almost white finish, which does not represent weathering. Floquil Grime is a good color for cement and flour spills.
- d. There is a HUGE advantage of in using PBL Star Brand Paints. They dry to the touch within a minute, they are self leveling and very tough. One thing that you must do is adjust the paint-to-thinner mixture based upon the temperature and humidity. What worked yesterday may not work today due the thinner's rapid evaporation. Another advantage is, once it is mixed and there is left over paint – pour it back into the jar. The paint will not re-crystallize into a solid. I have paints that are ten years old that I still use.

4. Weathering Your Locomotive and Tender

- a. Start with a newly "shopped" locomotive. The glossier the better*. Unless your intent is to weather a locomotive that is rarely cleaned or shopped, the contrast of gloss/semi-gloss, weathering and flat finishes will make a striking showpiece. Before you begin to paint, always ensure the surface is free of flux, oils or anything else that would prevent the paint from bonding to the surface.
- b. Brush paint the cab arm rests Testors Leather and let dry for about 45 minutes or longer.
- c. Cab Shades. These are canvas. New cab shades are either a light gray or light tan color. They get pretty filthy really fast. To create the canvas look mix in a similar color Bragdon's pigments into your "canvas" color and apply with a high quality brush. The pigment(s) gives the paint some "tooth" that looks like canvas and not just painted metal. Mixing in Baby Powder in your paint works the same way. Being white, Baby Powder does not change the color of your paint. Sometimes I will paint the cab shades last to represent new cab shades.
- d. The first color you should use is Jet Engine Exhaust and Burnt Iron sprayed into the coal bunker. This represents the scouring of the metal from repeated coal loads being dumped into the bunker.
- e. Next is rust. Rust forms on metal not on dirt, your road grime color will cover the rust.
 - To help bring out interior tender bunker detail(s) give the inside of the tender bunker a few shot of rust in the corners and on the reinforcement bars. This will give you nice contrast with the coal load and Engine Black coal board sides when you're finished.
 - Spray rust on the front bottom leading edges of your tender to represent internal water leaks coming out of the tender wrapper in this area. I spray the tender wrapper separate/off the frame. Most "K" class tenders when full with coal and water sat lower on the front truck, therefore water flowed in this direction and drained out. If desired, spray light rust streaks down the tender sides. These rust streaks and drainage stains should be faint.
 - Lightly spray the underside of your locomotive with rust while it's upside down in your foam cradle and running at slow speed. I like to spray the rear counter weights and wheels a little more rusty than anywhere else. This portion of the running gear gets the most weathering due to heat from the firebox, ash pan, cock valves, air pump water condensation and the scouring effect of the dirt hitting these moving parts.
 - You can also spray light rust streaks on each side of the fire-box to represent the metal heating and cooling effect. You'll paint soot over these streaks later on.
- f. Spray your road's grime color on your locomotive while it is running at a slow speed in the cradle so the weathering gets evenly applied. Once done, set it on the 'lazy-susan' for the rest of the weathering.
- g. Using your road grime color, start to spray the entire engine and tender from front to rear, with fine, misting coats. Using your Lego, prop the tender up and spray along the tender frame and trucks to

match what you have on the locomotive running gear. Make repeated passes in order to get the desired weathering and aging effect. Make very light vertical streaks on the tender sides and on the locomotive steam turret. When you think it's still too light - **STOP**. Step back, relax and take a hard look at it. You'll be surprised that you have used very little paint and achieved realistic effects in a short period of time. Remember that we modelers tend to overdo weathering!

*Another neat trick is to add some white to the basic engine black color during your initial paint job. This can help bring out some of the finer details than a solid black color. The shade of off black is up to your mind's eye in the light the locomotive will be displayed/operated in. Layout lighting is another factor in determining the shade of black you desire.



Custom Painted PBL K-36
This engine was has light weathering with 3/4 coal load.



Custom Finished PBL K-37, #492 with Medium-to-Heavy weathering.

This weathering represents about 18 months from last major overhaul. Note the tender truck "pig tails" water hoses painted a red rubber color. These hoses were used to cool the tender trucks when going down grade. The crew would just let them drip onto the truck/brake assembly.

- h. Now spray the Engine Black on the smoke box and stack to get the soot effect you want. I spray from the center top vertically down the side of the smoke box as soot would fall (repeat for the other side). Once done, the top of the smoke box will be more weathered than the sides. Study pictures for patterns. Then give the engine and tender a complete overspray of Engine Black. Give the tender coal boards a few passes. This will simulate coal dust on the top of the tender sides. Spray the tender deck to blend the rust in. You can use this color also to bring out/blend streaks on the tender. I spray Engine Black along the coal boards and along the top edge of the tender, muting some the weathering to represent this portion of the tender that does not get as weathered as the bottom does. This helps to bring out the illusion of the road grime being picked up and carried on to the tender from the draft. Engine Black will blend and mute your rust and road grime colors so neither one stands out over the other. For heavier soot, spray the locomotive with the Scale Coat II Loco Black at a high angle starting at the firebox and working back along the center top of the boiler to represent soot hitting these surfaces while the locomotive is in motion. My suggestion at this point is to wrap it up for the session and take an extended break.



Factory Painted PBL C-16. Majority of the weather was done with Bragdon's Pigments and sealed with PBL Flat

NOTE: I am not a fan of baking weathering. My main concern is the temperature could effect decals. Besides, you have used so little paint that it will dry very quickly.

5. Finishing Up/Highlights

- a. Bragdon Pigments. I cannot say enough about this outstanding product. They come in a variety of weathering colors which are not chalk but finely ground up pigments that will adhere very well to semi-flat or flat finishes. I use these in areas that I want to highlight and where I need exact control which I cannot achieve with an airbrush. Examples are additional rust, soot, dirt, steam turret water leaks, etc. Apply the pigments with a brush and dust off the excess. I find that I have much better control with the pigments and they are tremendously more forgiving than airbrushing. These pigments do not disappear as readily as chalks do when oversprayed with sealant. If necessary, you can add these pigments to your locomotive after you're done and they will stay in place. If you don't want to spray the final soot (Scale Coat II Flat Black) you can use DOC O'Brien's Weather Powder "Grimy Black". This is excellent for soot. It holds up to moderate handling.
- b. If everything looks good, seal your work with a clear flat or semi-flat as you see fit. Give areas that are picked up points extra coats so not to damage the weathering or finish.
- c. Now apply the Scale Coat II Loco Black to the front of the domes for that fresh soot look. If you want you can spray the tender coal bunker top to give the look of fresh coal dust. Scale Coat II is a very tough paint and will not wear due to repeated handling.
- d. Clean all electrical points.
- e. Add glass to windows. Use Floquil Crystal Coat to "glue" the glass in place.

- f. After you have the coal load in place (secured solidly in the bunker with glue) drip Floquil Crystal Coat or High Gloss onto the coal load. Don't brush (it will splatter - trust me) but dab it into the corners. Once the load is covered sprinkle on scale chunks of freshly ground coal and let dry. This will give the coal load a nice luster. When I do this, I have the tender front directly in front of me. I place a Post-it-Note over the front of tender and bring the brush up and into the coal load in this direction. This will avoid any paint getting where it shouldn't. Is this luster prototypical? Yes, for an experienced fireman would hose the coal load down just before departure to reduce the coal dust; hence clean, shiny coal.
- g. Add finely crushed coal representing cinders to areas on the locomotive and tender where they would gather. Cinders were generated by the hard work of the engine when either starting or going uphill and would fall back onto the locomotive from the stack as it is moving forward. Areas where cinders would collect are: running boards next to the boiler where pipes would catch cinders, base of steps on the running board, cab roof electrical conduit, cab roof hatch, cab rain gutters, sand and steam dome bases, pilot decks, tender deck corners and along conduit piping. In some videos you will see crews flooding the tender deck to wash off the accumulated cinders. Secure cinders with Floquil Flat, applied with a fine tipped brush.
- h. Add crew and working essential details such as shovels, water bags, oil/lube cans, tools, chains, water hoses (angel hair electrical wire), etc. to your locomotive and tender. From my readings and first hand experience, firemen rarely hung their shovel on the tender sides. Losing a shovel would be real bad news on a run! Most engines had shovels in them as a back up due to more than one shovel being lost into the firebox by fatigue and the strong draft created when the engine was moving with a full head of steam. The D&RGW issued their shovels to the fireman, not to the locomotive. It was thus ultimately the responsibility for the fireman to have his shovel when he reported for call. Extra shovels were mostly stored on the top of the back head, next to the front cab wall.
- i. For grease stains, use a fine tipped brush and lightly dry-brush gloss or semi-gloss black paint radiating out from the axle centers on the counterweights/wheels. Grease is normally slung out in straight lines from the axle - similar to the hands on a clock.
- j. Cab Curtains. There are three separate curtains for most D&RGW NG locomotives. One for each side then a short top curtain running from side to side on underside of the cab roof.



D&RGW K-27 Circa mid 1930's



Custom Painted PBL K-36 with homemade cab curtains.

Note there are four individual curtains. Curtains were made from high quality sketch paper. Curtains were attached with ACC. The cab has three lights in it plus ground lights.

k. I make my curtains from high quality sketch paper (tissue paper works well too) cut to the "approximate size". From what I have been able glean from pictures; the side curtains had three tiers to them. When opened the top tier some how attached/draped (?) along the top front edge of the tender. The second middle tier covered the open areas between the tender and locomotive sides. The bottom tier hung down below the deck plate. When closed the side curtains were accordion-folded to the cab and secured with straps. Paint and stain a piece of paper first then cut to size. It's easier to paint the paper on wax paper. The first coat of paint was Floquil Concrete, then Aged Concrete. While both the concrete colors were drying but still somewhat wet, I added a bit of white here and there and brushed it into the overall muted colors. This gives a new canvass/tarp look. Add weathering chalks or Bragdon's pigments to age them to your liking. I give the finished paper a few coats of Testors Dullcoat for a little more strength. The top curtain was cut so the bottom of the curtain is curved to the same curvature of the cab roof. On the top curtain I touched engine black to the bottom edge. The black paint was sucked up into the paper leaving a blackish "soot/dirt line" along the bottom edge. I secured them to the cab with ACC. Making the side cab curtains is easy. First, cut the cab curtains to approximate size. Then, soak them in water. This allows you to accordion fold them with each fold be rounded somewhat. If you can, avoid having paper type creases as you would in folding a letter to mail. Accordion fold them to the desired folded up size. I find that using tweezers to do the folding works best. Once dry, you can attach them to the rear of the cab – leave the tops unglued but touching the cab roof. If you find the need to adjust their shape – wet them again with a paint brush and water and make your adjustments. Once dry the shape and paint makes them very robust. You can ACC the folds to one another for a tighter fold if you want. As the ACC sets up, press with tweezers until dry. Use 1/2mm or 1mm black drafting tape for straps and you have some realistic curtains. I think these curtains help disguise the large gap we need between the locomotive and tender, and provide very realistic detail.



Custom painted OLM, K-36 with homemade cab curtains
You're **ALMOST** Done!

A few last details to bring your locomotive to life...



K-37, #492 Tender Deck Details and Tender Marker Lights.

Tender decks on some railroads were treated like trunks of a car, D&RGW NG locomotives where no exception. Note the chain, cinders, lubrication can, water hose with standing water, water bag hanging on the dog house door, rust stains and rust pitting, and the tools. Though not easily seen in this picture, the wood on the dog house has been weathered "board-by-board" so-to-speak using PRISMACOLOR pencils then sealed with PBL Flat. The tender marker lights are on their own separate circuit. All these little things bring your engine to "life" and make it unique.



Custom Painted OVL K-36 with flags and damaged spark arrestor.

Flags were made from brass and attached in home-made flag brackets. The spark arrestor was scratch built then “damaged” to simulate being worn out after repeated use. The elongated plow coupler shank was scratch built to allow for operation. Note the cinders on the plow and engine walkway.

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PBL: <http://www.p-b-l.com/>

Bragdon Pigments: <http://www.bragdonent.com/index.htm>

Simple, but Vital Tips to Preserve Your Masterpiece

Handling Your Locomotive: I strongly recommend that you never pick up your equipment with bare hands - wear clean cotton gloves. Your skin oils will get on and into the finish and damage it. Never touch your locomotive with sweaty hands - sweat will destroy a finish. BEWARE: when you are placing your locomotive and tender down, your cotton glove may catch on piping or re-railing hooks. If this happens, gently untangle the glove from the locomotive or tender. If that doesn't work, remove your hand from the glove and free it this way. I pick up my tenders by their steps and the locomotives under the cab and walkway near the steam chest. These areas are very easy to touch up versus tender sides, air reservoir tanks, cab sides, steam chest, etc.

Mistakes: If you make a mistake on some factory painted locomotives or a factory painted locomotive's weathering is not to your liking, there is hope. Mineral Spirits will remove Floquil paints but leave the factory paint and pad printing intact. It will return your piece to as clean as it was the day it was painted. Even the coal load will remain intact in some cases. So if you're frustrated with someone else's weathering, try this before you strip it for a total repaint.

Packing Your Locomotive: ALAWYS wash the protective plastic wrap your locomotive and tender comes in. Why? Because oil and grease from the running gear may seep onto the plastic. These oils will in turn bleed into and stain your finish. To avoid this ugly mistake, wash the plastic in hot dish washing soap and water then let air-dry.

Working on a Finished Locomotive: Eventually you will have to work on your locomotive. Wear your gloves (latex or cotton) as much as you can. Use tissue paper to protect the locomotive and tender when it's in a foam cradle. Foam is somewhat abrasive and it will wear on a finish. Place a new and clean tissue between the locomotive and foam for protection. Plastic sheets work better than tissue paper - just remember to wash the plastic after every use. Wash your foam cradle periodically to remove oils and grease. DO NOT use tissue paper if you are painting while the locomotive is in the foam cradle - use plastic. The tiny lint particles from tissue paper will find a way onto your finish...trust me, they're very good at this!

Main and Side Rod lubrication: Oils will act as a solvent on paints. If at all possible, use PBL's Neo-Lube which is graphite suspended in liquid and is a great lubricant. It dries to a steel black color in seconds and leaves no residue that will transfer onto anything once dry. Another advantage of Neo-Lube over oils is that oils attract dirt, dirt affects performance and you will eventually have to clean these areas. Neo-Lube will save you a lot of touch-ups and cleanings over the life of your locomotive.

Credit to Others. I cannot take total credit for all these techniques. They come from many fine modelers and some of my own creations. I would like to thank and give credit to William Adkins, Al Boos III, Jimmy Booth, Jim Brown, Kelley Morris, Roland Shilladay, and Roger Watkins. A final appreciation for Randy Smith for taking some of these fine photographs.